

Title : THE STUDY OF EFFICIENCY INCREASING OF PV MODULE WITH ALUMINIUM FIN

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The purposes of this research were to study the efficiency increasing of PV module with aluminium fin, to compare the efficiency of PV module with aluminium fin and PV module without aluminium fin, and to estimate economic suitability of PV module with aluminium fin.

The samples of this research were specific random of three PV modules version M75/S47 type single crystal silicon with the size of $0.33 \times 1.2 \text{ m}^2$. Raw materials which attached the back side of PV module by using thermal-conductivity silicone were aluminium fins with T shape as follows : (i) forty-one pieces of aluminium fins with the size of 0.024 m width, 0.27 m length, and 0.001 m thickness ; (ii) twelve pieces of aluminium fins with the side of 0.024 m width, 0.097 m length, and 0.001 m thickness. The formulae for calculating the efficiency of the PV module and for analyzing the data were given by the following : $\eta_m = [P_m/A_m G_T] \times 100\%$, $Q = m k A \theta_o \tanh mL$, $C_a = C_{m,x} P_w$, $LCC = C_c + C_a$, $ALCC = LCC/P_w$, $E = ALCC/\text{Electricity per year}$.

The results of this research showed that the average of short circuit current of PV module with aluminium fin was 2.30 A, the average of short circuit current of PV module without aluminium fin was 2.31 A, the average of open circuit voltage of PV module with aluminium fin was 17.56 V, the average of open circuit voltage of PV module without aluminium fin was 17.14 V, the average of temperature of PV module with aluminium fin was 46.7°C , the average of temperature of PV module without aluminium fin was 54.9°C , the average of maximum power of PV module with aluminium fin was 23.42 W, the average of maximum power of PV module without aluminium fin was 22.94 W, the average of maximum efficiency of PV module with aluminium fin was 7.72%, the average of maximum efficiency of PV module without aluminium fin was 7.56%, and the average of heat transfer rate of PV module with aluminium fin was 12.650 W. The costs per electrical unit of PV module with aluminium fin and without aluminium fin were 0.438 baht/kWh and 0.442

baht/kWh, respectively. The result from estimation of economic suitability showed that the PV module with aluminium fin was more suitable than the PV module without aluminium fin.